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The implications of symbolic systems and non-symbolic systems in fraction understanding

Recent advances in the field of mathematics cognition have suggested that there are two cognitive systems that deal directly with knowledge of number and mathematics. The first is known as the “symbolic” system. At its basic level, this system underlies the understanding of how a symbol (e.g., the symbol “2”) can refer to a numerosity (e.g., the quantity of 2) and also how to manipulate these symbols to generate exact answers to questions (e.g., $2 + 3 = 5$). The non-symbolic system, found in both humans and animals, is not exact and instead allows for quick and approximate estimates of quantity that are almost done unconsciously. To date, the research that has explored how these two systems interact has largely investigated simple operations with whole numbers. This paper will instead consider how these systems might interact in the more complicated topic of fraction understanding. More specifically, I will explore how conceptual and procedural knowledge of fractions are related to subitizing, quantity estimation, and working memory and the possible implications of these data for the teaching of fractions.